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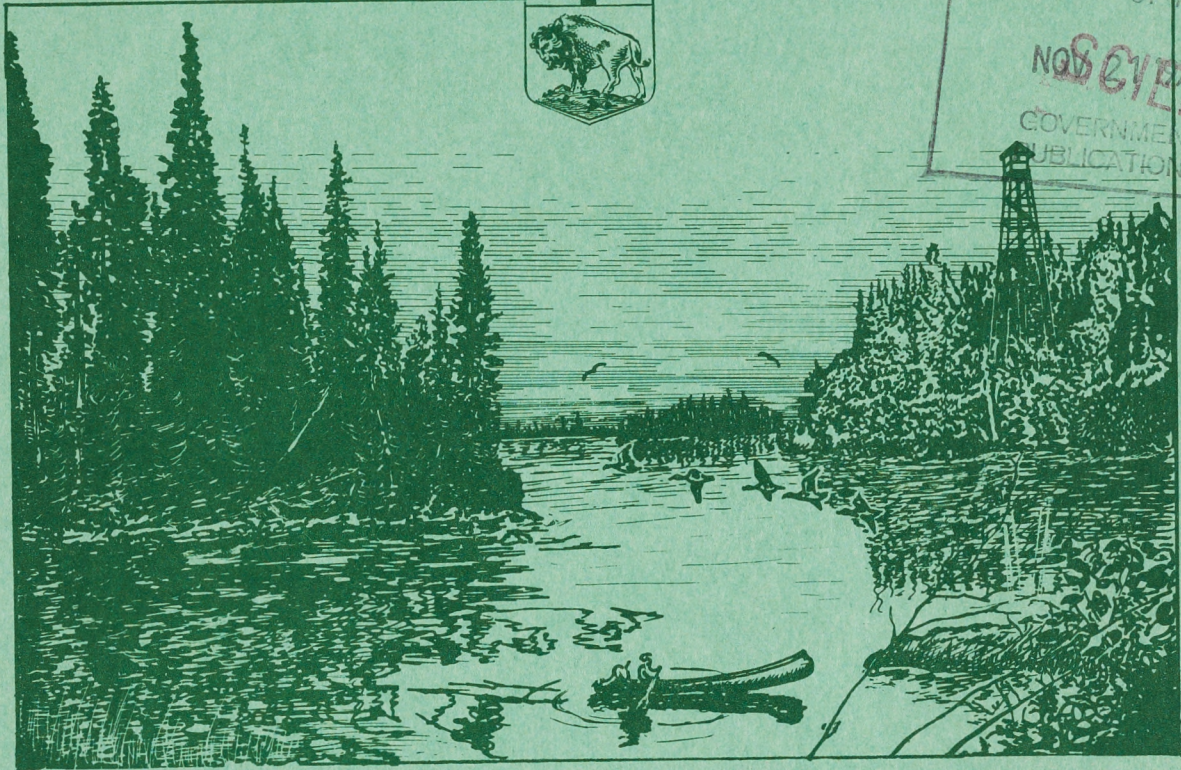


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Report No. 9

INACCESSIBLE FOREST ZONE

and the uncruised portion of the Inaccessible Area of Manitoba



Forest Resources Inventory

—1956—

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FOREST SERVICE

Department of Mines and Natural Resources
PROVINCE OF MANITOBA

Winnipeg, 1960

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INACCESSIBLE FOREST ZONE

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of Manitoba



FOREST SERVICE
Department of Mines and Natural Resources
PROVINCE OF MANITOBA
Winnipeg, 1960



Forest ~~Reserve~~ Inventory photograph, taken over Island Lake. Scale two inches to the mile.
Resources

—R.C.A.F.

Preface

This is one of a series of bulletins summarizing the results of the ground and aerial survey work which was completed in 1956 in connection with the latest Forest Inventory of Manitoba. The figures in this new series will replace those previously used based on surveys made between 1927 and 1930, and tabulated in "The Forests of Manitoba, Bulletin 85," published by the Dominion Forest Service in 1934.

For the purpose of the new Forest Inventory the Province has been divided (as shown on Map 1) into four zones based on climate, original vegetation, and predicted future use, as follows:

Agricultural Forest	Transition from Forest to Tundra Tundra or Barren Lands
------------------------	--

The Forest Zone may be defined as the area which is producing or is capable of producing forest crops and which for climatic reasons is, in the main, more suitable for the production of wood than for agricultural crops. The Forest Zone has an over-all area (omitting the three major lakes—Winnipeg, Manitoba and Winnipegosis) of about 113,000 square miles or nearly half the total area of Manitoba (less these lakes).

Based on the presence or absence of transportation routes such as railways, highways and water routes, the Forest Zone is again divided into an Accessible and Inaccessible Area.

The Accessible Forest Zone with an over-all area of about 64,000 square miles has been divided for Inventory purposes into eight Forest Sections based on physical geography and administrative boundaries, as follows:

Southeastern	Lowlands North
Winnipeg River	Nelson River
Lowlands South	Northern Mining
Mountain	Southwestern

Each of the Forest Sections is again divided into Working Circles which conform with Forest Ranger Districts, except in the more northerly areas where on account of their large size it has been necessary to subdivide the Ranger Districts.

The Inaccessible Forest with an over-all area of about 49,000 square miles has been divided into 20 Inventory Units.

Although a limited amount of the Forest Zone was inventoried before 1951, the main work was done commencing April 1st, 1951, from which date the Federal Government has reimbursed to the Province one-half of the expenditures incurred in forest resources inventory under the terms of an agreement with the Province pursuant to the provisions of the Canada Forestry Act.

A separate report has been published for each of the eight Forest Sections of the Accessible Area. The whole of the Inaccessible Forest is covered by the present report.

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PREPARED BY FOREST MANAGEMENT DIVISION

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Maps Nos. 1 and 2 by P. Peloquin.

Tables Nos. 1 to 10 and figures Nos. 1 to 10 by L. Pasterz.

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Setting up portable radio at survey camp—Wimapedi Lake.

Forest Resources

INACCESSIBLE FOREST ZONE

and the uncruised portion of the Inaccessible Area of Manitoba

Location and Area

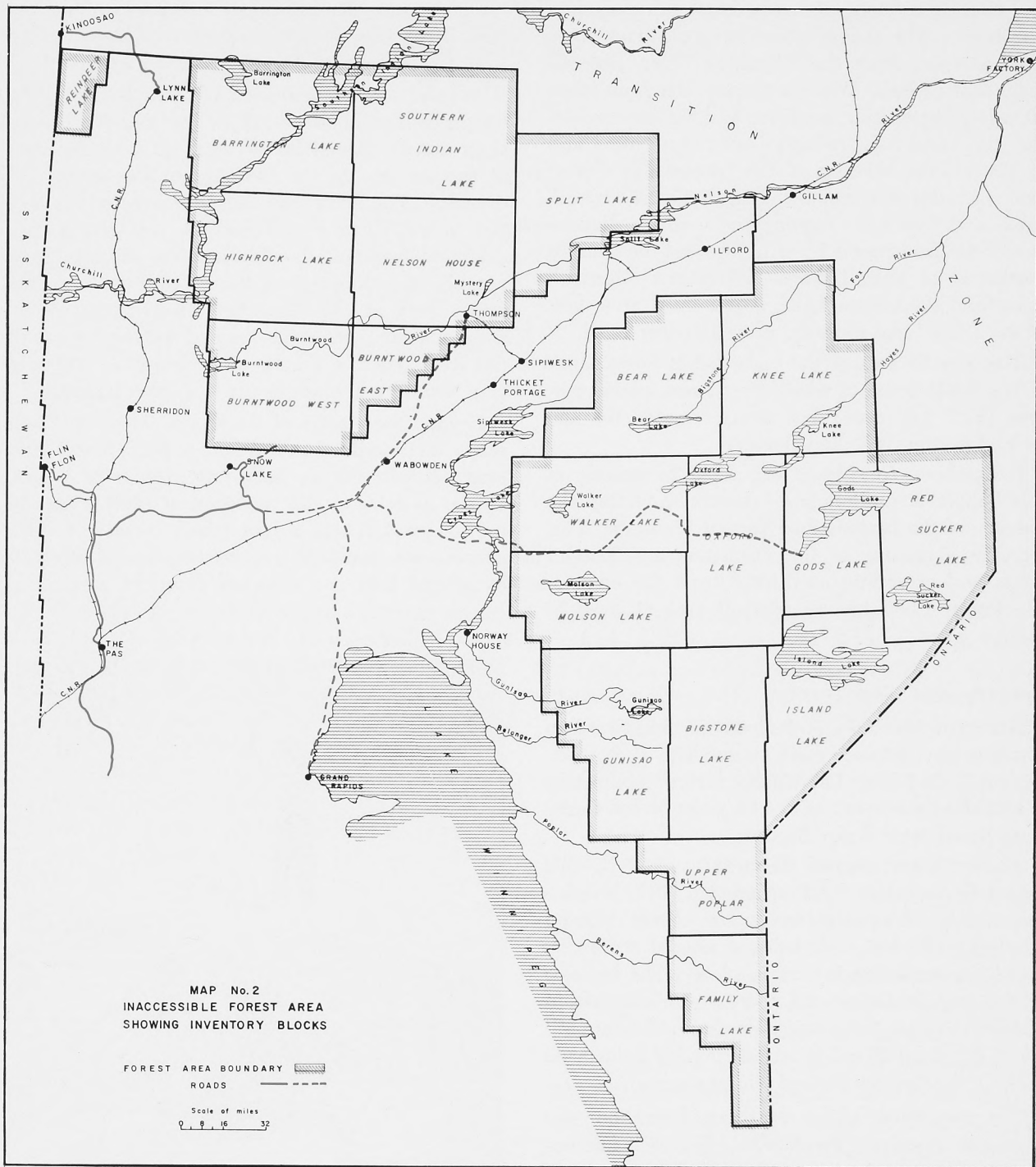
The Forest Zone extends northward to the point where timber of commercial size ceases to occur in stands of sufficient extent to warrant ordinary timber operations. For inventory purposes, a northern boundary has been established commencing at a point on the Ontario boundary at approximately 54°30' latitude, and extending in a north-westerly direction to approximately 57° latitude on the Saskatchewan boundary. For convenience, this line has been made to agree with theoretical township and range lines of the Dominion Land Survey system.

The Inaccessible Forest includes that part of the Forest Zone which, in 1951, when the inventory was planned, was considered unexploitable by commercial operators due to lack of transportation and distance from markets. At that time it could not be predicted that as a result of important mineral discoveries, a railway line would shortly be pushed for some distance into the so-called Inaccessible Area, and an important town established at Thompson on the Burntwood River. It may be confidently assumed that similar developments in the not too distant future will extend the Accessible Area boundary at other points.

Table 1

Summary of Land and Water Area
Inaccessible Forest Zone and Uncruised Inaccessible Area

Description	Land Area			Water <i>acres</i>	TOTAL AREA <i>acres</i>
	Cruised <i>acres</i>	Uncruised <i>acres</i>	Total Land <i>acres</i>		
FOREST ZONE					
Eastern Division.....	16,383,646	.....	16,383,646	3,234,522	19,618,168
Northern Division.....	10,322,067	.....	10,322,067	1,402,595	11,724,662
Total—Provincial Crown.....	26,705,713	.....	26,705,713	4,637,117	31,342,830
Indian Reserves.....	.....	91,014	91,014	.....	91,014
TOTAL FOREST ZONE.....	26,705,713	91,014	26,796,727	4,637,117	31,433,844
PER CENT OF LAND AND WATER AREA.....	.....	.....	85.2	14.8	100.0
TRANSITION AND TUNDRA					
Provincial Crown.....	.....	51,393,787	51,393,787	6,801,037	58,194,824
Indian Reserve.....	.....	10,711	10,711	.....	10,711
TOTAL TRANSITION AND TUNDRA.....	.....	51,404,498	51,404,498	6,801,037	58,205,535
PER CENT OF LAND AND WATER.....	.....	.....	88.3	11.7	100.0
SUMMARY OF LAND AND WATER AREA					
GRAND TOTAL.....	26,705,713	51,495,512	78,201,225	11,438,154	89,639,379
PER CENT OF LAND AND WATER AREA.....	.....	.....	87.2	12.8	100.0



For the purpose of definition of the boundary between the Accessible and Inaccessible Forest, the Winnipeg River, lakes Winnipeg and Winnipegosis, and existing railways are considered as transportation routes. The Inaccessible Forest includes areas over 60 miles from the Winnipeg River, over 40 miles east of Lake Winnipeg, and belts from 60 to 30 miles, diminishing northward, along the Hudson Bay and Lynn Lake railways—see Maps Nos. 1 and 2. The eastern division of the Inaccessible Forest area includes the Family, Island, Gods, Oxford, Knee, and Bear Lake regions; the northern division covers the Burntwood River region and the country northwest of Split Lake as far as the Churchill River and Barrington Lake, also a small area west of the Lynn Lake Railway, near Reindeer Lake.

The over-all area of the inaccessible Forest Zone is 31,433,844 acres, of which the Crown owned portion (99.7 per cent) has been cruised; the uncruised portion is Indian Reserve.

It has been considered expedient to include in this report a preliminary estimate covering the balance of the Inaccessible Area of Manitoba. This balance, consisting of the Transition and Tundra zones and extending northward from the edge of the Forest Zone has an over-all area of over 58 million acres.

Geology and Topography

Northern Manitoba is drained northeastward to Hudson Bay by four main rivers: Hayes, Nelson, Churchill, and Seal. The highest recorded elevation is 1,670 feet above sea level, at a point on the Cochrane River, near Lake Brochet.

About 80 per cent of the area covered by this report is underlain by Precambrian rock, consisting mainly of granites and other coarse grained igneous rocks, but with belts of altered sediments and lavas occurring in certain places. The balance of the area, including the country extending from Hudson Bay up the Hayes, Nelson, and Churchill rivers for about 80 miles, is underlain by Palaeozoic rocks of the Ordovician and Silurian period.

The glaciation which northern Manitoba was subjected to during the Pleistocene epoch left behind it features which appear in the modern landscape. The advancing glacier had the effect of rounding off the pre-existing rock ledges and partially filling the hollows with drift material. When

the ice-front was static, morainic ridges were formed along the front or between separate glacial lobes. Two of these interlobate moraines are conspicuous: one running north and south along the Stull River, east of Gods Lake; a second, extending from the vicinity of Thompson, northward.

As soon as the ice-front had retreated over the height of land between the Nelson and the Mississippi basins, glacial lakes began to form in front of the ice due to the blocking of the northward drainage. The main lake (Agassiz) covered most of the Nelson River Forest Section, and also a considerable part of the Inaccessible Forest Area, notably the Burntwood River country and the upper part of the Churchill River basin. When these glacial lakes were drained by the retreat of the ice barrier, a mantle of sedimentary silt and clay was left behind in the old lake bottoms.

Beyond the margin of the glacial lakes, the landscape was modified in a different way. Rivers running beneath the ice have left a series of ridges, known as eskers, with direction at right angles to the ice-front. These ridges which consist of sand, gravel, and boulders, are interrupted at intervals by glacial fans and outwash plains of sandy ma-



—Dominion Forest Service

*Lumber production by pit-saw method, Island Lake.
Photo taken about 1910.*

LAND AND WATER AREA

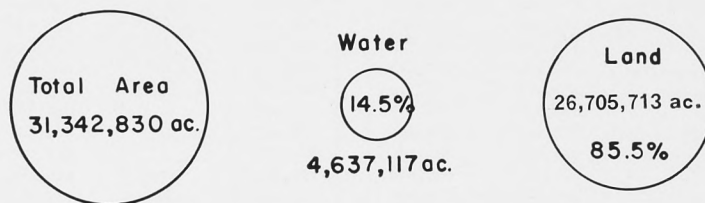


Figure 1

terial, deposited at points where the rivers emerge from the ice. Esker ridges are especially conspicuous in the district north of the Churchill River.

Another glacial effect is shown in the Hudson Bay lowlands which have a surface deposit of marine clay resulting from the subsidence of the earth's crust during the period of glaciation. This marine clay covers approximately the area underlain by the Palaeozoic limestones and extends inland to an elevation of about 425 feet above sea level in the region between the lower Churchill and the Ontario boundary. As the land gradually rose again above the sea, a series of marine beaches were formed, which are now the most conspicuous features of this lowland area.

Climate and Vegetation

The Inaccessible Forest area, see Map No. 1, has the same climate and vegetation as the adjoining Nelson River and Northern Mining subsections of the Accessible Forest, see Forest Inventory reports Nos. 6 and 7. This would be expected from the fact that climatic lines in this part of Canada run in approximately a northwest and southeast direction, and that the accessibility of the Nelson

River and Northern Mining forest sections is fortuitous, resulting from the existence of a seaport in one case, and of mineral discoveries, in the other. Thus, the forests along a line drawn through Island Lake in the eastern Inaccessible Forest area, Sipiwesk Lake in the Nelson River section of the Accessible Forest, and Granville Lake in the northern Inaccessible area, would be expected to be similar in species composition and in size of trees. Field examination proves this supposition to be true, wherever soil, drainage, and age of the forest is similar. The numerous variations in stand conditions are due in large part to past fire history; although the presence or absence of drainage has great weight; also, though probably to a lesser extent, the depth and texture of the soil.

A comparison of Map No. 1 in this report with "Forest Regions of Canada"* will show that the northern boundary of the Forest Zone in the former agrees approximately with the northern boundary of the Northern Coniferous Section, B22A of the latter.

*Forest Regions of Canada, by J. S. Rowe, Bulletin 123, Forestry Branch, Department of Northern Affairs and National Resources, 1959.

Table 2

*Area Classification in Acres—Inaccessible Forest Zone
Provincial Crown Land*

Inventory Blocks	*Productive Forest			Potentially Productive Forest †	Non- Productive Forest ‡	Permanently Nonforested Land ‡	TOTAL LAND
	Unmerchantable	Merchantable	SUBTOTAL				
EASTERN DIVISION							
Bear Lake.....	666,525	88,651	755,176	1,313	781,445	28,238	1,566,172
Bigstone Lake.....	251,686	272,552	524,238	.....	736,802	266,031	1,527,071
Family Lake.....	418,136	256,076	674,212	71,347	216,439	63,025	1,025,023
Gods Lake.....	311,590	174,853	486,443	2,692	488,017	17,212	994,364
Gunisao Lake.....	104,985	305,175	410,160	.....	854,230	429,071	1,693,461
Island Lake.....	323,900	497,972	821,872	582	638,294	27,178	1,487,926
Knee Lake.....	922,249	36,733	958,982	.....	1,004,897	33,453	1,997,332
Molson Lake.....	229,059	186,109	415,168	.....	609,737	177,651	1,202,556
Oxford House.....	621,511	277,834	899,345	588	315,954	97,176	1,313,063
Red Sucker Lake.....	289,603	152,042	441,645	658	947,136	84,907	1,474,346
Upper Poplar Lake.....	321,570	174,923	496,493	32,880	243,973	69,706	843,052
Walker Lake.....	248,593	288,395	536,988	5,872	661,612	54,808	1,259,280
SUBTOTAL.....	4,709,407	2,711,315	7,420,722	115,932	7,498,536	1,348,456	16,383,646
PERCENTAGE.....	28.7	16.6	45.3	0.7	45.8	8.2	100.0
NORTHERN DIVISION							
Barrington Lake.....	907,961	43,781	951,742	2,021	512,581	57,926	1,524,270
Burntwood East.....	541,306	114,777	656,083	.....	446,741	49,565	1,152,389
Burntwood West.....	486,408	184,530	670,938	1,304	373,612	19,560	1,065,414
Highrock Lake.....	827,874	149,893	977,767	11,824	525,835	85,390	1,600,816
Nelson House.....	1,232,059	172,161	1,404,220	1,230	235,812	60,395	1,701,657
Reindeer Lake.....	67,719	11,721	79,440	.....	173,205	6,511	259,156
South Indian Lake.....	1,262,719	56,489	1,319,208	4,133	247,997	28,933	1,600,271
Split Lake.....	67,564	115,995	183,559	.....	1,234,535	.....	1,418,094
SUBTOTAL.....	5,393,610	849,347	6,242,957	20,512	3,750,318	308,280	10,322,067
PERCENTAGE.....	52.3	8.2	60.5	0.2	36.3	3.0	100.0
GRAND TOTAL.....	10,103,017	3,560,662	13,663,679	136,444	11,248,854	1,656,736	26,705,713
PERCENTAGE.....	37.8	13.4	51.2	0.5	42.1	6.2	100.0

*Land supporting merchantable timber or young growth which will produce merchantable timber within a reasonable time.

†Cut-over, burn, brush or grassland, not now supporting productive forest, but capable of doing so.

‡Land with a forest cover such as treed muskeg, treed rock, and willow or alder swamp, but incapable of producing a forest crop of merchantable size within a reasonable time.

‡Includes marsh, muskeg, rock, meadow, developed agricultural land, urban areas, roads and railroads. In general, lands not expected to produce forest of any kind.

Climatological data for this area is very sketchy, no weather records having been published covering any station in this part of the Forest Zone. From records kept at Churchill and Port Nelson to the north, and at a number of points to the south, it has been possible, however, to give some approximate figures for the Inaccessible Forest Area. The annual precipitation is from 15 to 20 inches, June and July being the wettest months. The average daily maximum temperatures for the hottest month, July, is from 70° to 75° above, and the mean daily minimum for the coldest month, January, is from

15° to 30° below zero. The average length of the annual period free from heavy frost, taken as 29.5°, ranges from 104 to 119 days; the frost free period, using 32.5°, is from 80 to 93 days.

The tree species in the Inaccessible Forest are, as would be expected, the same as those in the adjoining Northern Mining, Nelson River, and Winnipeg River forest sections of the Accessible Forest, namely, black and white spruce, jack pine, aspen and balsam poplar, white birch, balsam fir, and tamarack. Even within the Forest Area, as here mapped, there are large areas which are either non-

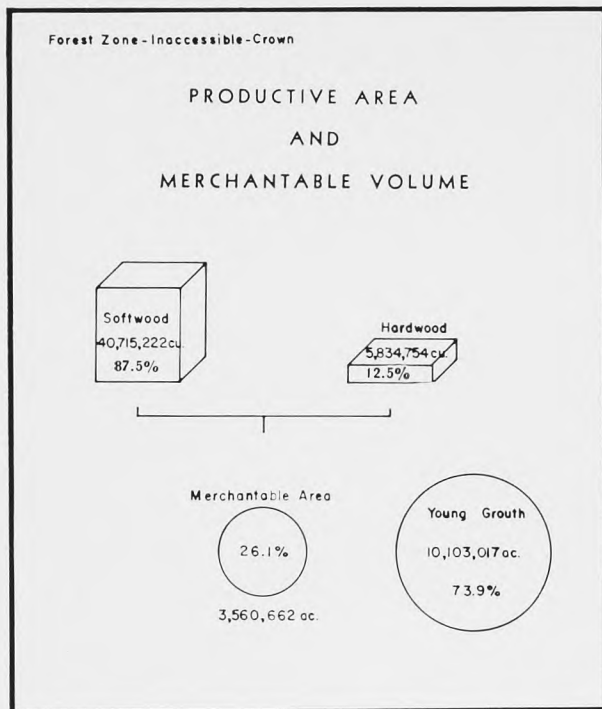


Figure 2

forested, or have a poor forest cover. With the present state of our knowledge, it is not always possible to say whether this condition is the result of repeated fires or of poor drainage.

North of the Forest Zone lies a belt of country, from one to two hundred miles wide, which, because of climatic conditions, has been described as Transition, referring to the varying mixture of forest and tundra vegetation which it supports. For inventory purposes, it has been necessary to draw arbitrary lines between the forest and transition zones and between the transition and tundra, but actually the two types of vegetation are very intricately mixed across this whole belt. Other things being equal, the percentage of forest vegetation decreases along a line running from southwest to northeast; temperatures are lowered, growing seasons shortened, and the extent of permanently frozen ground increased, in the same direction. The climatic influence on vegetation is masked to a large extent by local conditions, especially by the presence or absence of drainage. Good forest growth in the Transition Zone tends to be confined to the shores of rivers and lakes, while level areas back from the shore lines support the sphagnum moss of the muskeg, or the mixed vegetation of

moss and scattered, stagnated spruce and tamarack, characteristic of the treed muskeg. Higher areas, usually with thin gravelly or rocky soil, have typical upland tundra vegetation consisting largely of reindeer moss (lichen), heath plants, with some grasses, and sedges, the only tree species being white birch, and this in a very dwarfed condition.

As climatic conditions become more severe towards the north and east, the tree species drop out one after another. The first tree to disappear is the balsam fir, and indeed this species is of little importance in the northern coniferous forest and almost absent from the Transition Zone. Jack pine extends well into the Transition Zone, but is found only on well drained ridges. White birch, aspen and balsam poplar disappear in the order given, so that the two spruces and the tamarack are the only tree species to reach the Tundra Zone.

The Tundra Zone is characteristically treeless, with less than one per cent of the land occupied by forest cover. The trees are found only along the shores of rivers and lakes, and on morainic ridges.



—Dept. of Industry and Commerce

Lookout tower and cabin—Sasaginigak Lake.

The spruces may be only a few feet high, even at maturity, and tamarack is often the tallest tree, especially on the ridges. Low shrubs become important as ground cover, especially willow, dwarf birch, Labrador tea, bearberry, bilberry, cranberry, and crowberry.

Early History

The shore of Hudson Bay, at least as far northwest as the mouth of the Churchill, was Cree country when the first explorers and fur-traders arrived on the coast. The Cree tribe is a subdivision of the Algonkian stock which originally

Table 3
Area Classification of Productive Forest by Cover Types and Merchantability
Inaccessible Forest Zone—Provincial Crown

Inventory Blocks	COVER TYPES IN ACRES									
	Softwood				Mixedwood		Hardwood		TOTAL	
	SY* Unmerch.	SM-1* Merch.	SM-2* Merch.	SM* Merch.	MY Unmerch.	MM Merch.	HY Unmerch.	HM Merch.	Unmerch.	Merch.
EASTERN DIVISION										
Bear Lake.....	587,068	68,951	11,820	80,771	74,204	7,223	5,253	657	666,525	88,651
Bigstone Lake.....	219,085	159,749	52,815	212,564	24,125	47,599	8,476	12,389	251,686	272,552
Family Lake.....	247,973	146,907	58,628	205,535	48,375	35,894	121,788	14,647	418,136	256,076
Gods Lake.....	202,297	118,366	4,668	123,034	83,747	44,330	25,546	7,489	311,590	174,853
Gunisao Lake.....	96,508	196,277	58,688	254,965	7,825	48,906	652	1,304	104,985	305,175
Island Lake.....	245,696	317,559	8,519	326,078	58,237	128,888	19,967	43,006	323,900	497,972
Knee Lake.....	802,868	33,453		33,453	116,757	3,280	2,624		922,249	36,733
Molson Lake.....	200,426	145,764	20,823	166,587	25,379	17,570	3,254	1,952	229,059	186,109
Oxford House.....	485,086	212,396	8,322	220,718	126,626	51,957	9,799	5,159	621,511	277,834
Red Sucker Lake.....	173,104	121,107	7,898	129,005	90,830	19,088	25,669	3,949	289,603	152,042
Upper Poplar Lake.....	266,989	105,875	40,771	146,646	29,592	20,386	24,989	7,891	321,570	174,923
Walker Lake.....	201,615	219,232	26,752	245,984	45,021	38,496	1,957	3,915	248,593	288,395
SUBTOTAL.....	3,728,715	1,845,636	299,704	2,145,340	730,718	463,617	249,974	102,358	4,709,407	2,711,315
TOTAL.....	5,874,055				1,194,335		352,332		7,420,722	
NORTHERN DIVISION										
Barrington Lake.....	596,102	36,372	5,388	41,760	133,365	1,347	178,494	674	907,961	43,781
Burntwood East.....	478,045	82,821	4,565	87,386	54,131	22,826	9,130	4,565	541,306	114,777
Burntwood West.....	438,811	142,793	11,736	154,529	42,381	17,603	5,216	12,398	486,408	184,530
Highrock Lake.....	580,855	103,006	3,508	106,514	94,895	35,323	152,124	8,056	827,874	149,893
Nelson House.....	653,984	117,338	6,329	123,667	226,072	38,789	352,003	9,705	1,232,059	172,161
Reindeer Lake.....	62,510	5,209	3,907	9,116	5,209	2,605			67,719	11,721
South Indian Lake.....	604,149	46,844	2,756	49,600	242,486	6,889	416,084		1,262,719	56,489
Split Lake.....	62,893	77,909	14,857	92,766	4,583	23,229	88		67,564	115,995
SUBTOTAL.....	3,477,349	612,292	53,046	665,338	803,122	148,611	1,113,139	35,398	5,393,610	849,347
TOTAL.....	4,142,687				951,733		1,148,537		6,242,957	
TOTAL INACCESSIBLE FOREST ZONE—PROVINCIAL CROWN										
SUBTOTAL.....	7,206,064	2,457,928	352,750	2,810,678	1,533,840	612,228	1,363,113	137,756	10,103,017	3,560,662
GRAND TOTAL.....	10,016,742				2,146,068		1,500,869		13,663,679	

*SY refers to undifferentiated softwood, young growth types.

*SM-1 refers to merchantable types where spruce is predominant.

*SM-2 refers to merchantable types where jack pine is predominant.

*SM column shows totals of these two merchantable types.



Forest fire—Sharpe Lake.

—Dennis Allen

inhabited most of the spruce forest country from the mouth of the St. Lawrence to the Athabasca River in Alberta. The country north and west of the Churchill was probably held by the Chipewyan tribe of the apparently unrelated Athapaskan stock.

For the first hundred years after fur-trading posts were established on Hudson Bay, the Cree Indians of the coastal areas were in a favored position with regard to the fur trade. They were able to sell not only their own furs but also furs bought from other bands or tribes located further inland. In exchange for furs, they procured firearms, steel knives, tomahawks, and traps, which could also be traded inland, or, in the case of the weapons, used against rival tribes.

Capt. Thos. Button, on an exploring expedition, was forced to winter at the mouth of the Nelson River in 1612-13, and hence became the first white man to visit northern Manitoba, although he was closely followed by Jens Munck, who wintered in the Churchill River area in 1619-20. After the establishment of the Hudson's Bay Company in 1670, visits were made regularly, although for a time the main posts were located further south on James Bay. In 1682, a trading post was established at the mouth of the Nelson River (shortly afterward, transferred to the Hayes River and named York

Fort or Factory). This location has been continually occupied from that date to the present time, although not always by the English company. During the wars between England and France, it was captured by a French naval expedition, recaptured by the English, captured again by the French, and occupied by them for 17 years from 1697 to 1714,

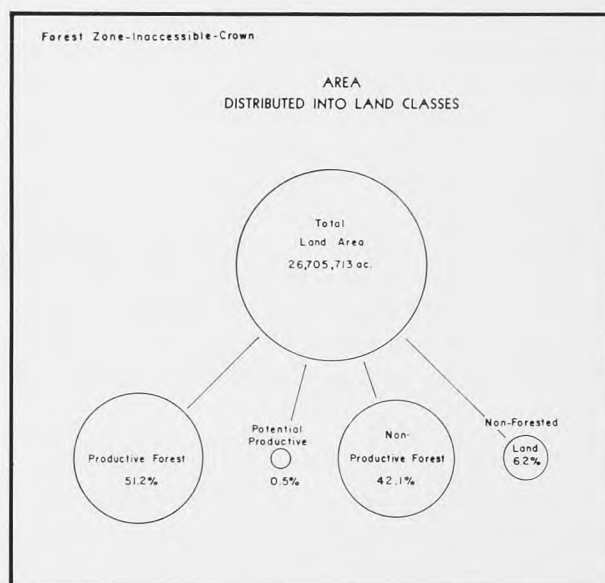


Figure 3

Table 4

*Summary of Merchantable Volume in Cunits by Cover Types and Species
Inaccessible Forest Zone—Provincial Crown Land
(Estimate based on original field data collected in 1955-56)*

Type*	†VOLUME IN CUNITS (100 cu. ft. Units)								
	Softwood				Hardwood		Total Soft-wood	Total Hardwood	TOTAL
	White spruce	Black spruce	Balsam fir	Jack pine	Poplar	White birch			
SM-1.....	5,353,374	24,387,027	1,178,735	1,253,432	688,220	565,323	32,172,568	1,253,543	33,426,111
SM-2.....	114,291	520,659		2,504,525	38,802	116,407	3,139,475	155,209	3,294,684
MM.....	584,065	2,660,743	330,603	1,184,448	2,453,160	650,385	4,759,859	3,103,545	7,863,404
HM.....	24,052	109,571	41,327	468,370	1,019,394	303,063	643,320	1,322,457	1,965,777
TOTAL.....	6,075,782	27,678,000	1,550,665	5,410,775	4,199,576	1,635,178	40,715,222	5,834,754	46,549,976
PERCENTAGE	13.1	59.5	3.3	11.6	9.0	3.5	87.5	12.5	100.0

*See Appendix for explanation of type symbols.

†Net roundwood volume: stump height 1', top diameter 3"; one stacked cord equals 85 cu. ft. of wood.

being finally restored to the English by the Treaty of Utrecht which ended the War of the Spanish Succession.

After peace was declared, the Hudson's Bay Company established a post at the mouth of the Churchill and sent a number of expeditions inland to explore and to establish trade relations with the Indians, the most famous of which was Samuel Hearne's trip from Fort Churchill to the Coppermine River. During the American Revolutionary War a French fleet temporarily interrupted the Company's fur trade, when the stone fort at the mouth of the Churchill River was partly destroyed and the wooden fort on the Hayes was burned.

The Hayes River route to the interior seems to have been established about 1757 after which date it became the Hudson's Bay Company's main trade route to the prairies, and later to the Rocky Mountains and the Athabasca country. After the union with the Northwest Company in 1821 when the route to Montreal was closed to heavy traffic, the Hayes River route with its brigades of York boats became even more important. This situation continued until about 1858, after which date more and more traffic was diverted southward by way of St. Paul, Minnesota, and later by rail through Eastern Canada.

Development of the Area

As soon as any considerable settlement had taken place in the province, the people of Manitoba began to promote the idea of a seaport on Hudson Bay to be connected by rail with the agricultural south.

Various schemes were put forward for a railway or a combined rail and water route, but it was not until 1910 that the Dominion Government authorized the construction of a rail line, and a seaport on the Bay. At first it was planned to use the estuary of the Nelson River for a port, and by 1918 the rails had reached Kettle Rapids and the Nelson River had been bridged at that point, and also further south at Manitou Rapids; while the grade had been

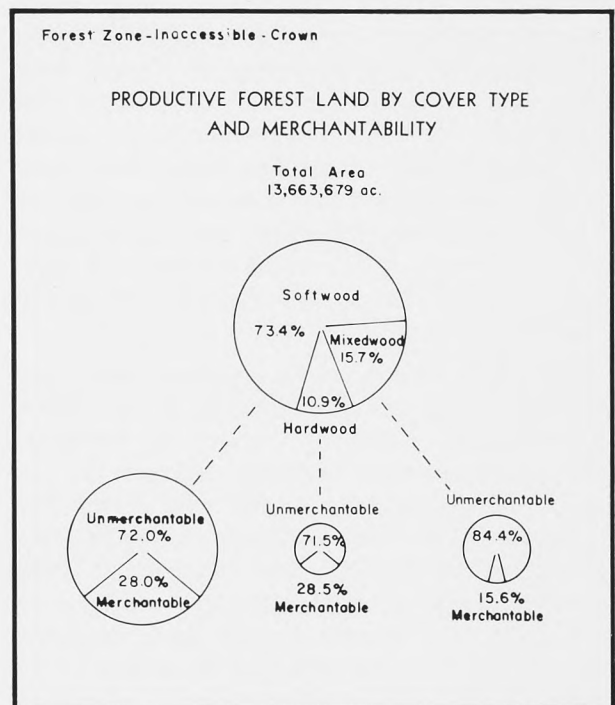


Figure 4

extended to Port Nelson, and harbour work had commenced there. The open nature of the Nelson River mouth, and the expense involved in making a harbour which would be safe for shipping, caused second thought to be taken, and after a further investigation by marine engineers, the decision was made to divert the rail line at the Limestone Rapids of the Nelson, and to build northward from that point for a distance of 154 miles to the mouth of the Churchill River where a better port could be developed.

Due to interruption of work by the First World War, and indecision with regard to the site of the port, it was not until 1931 that the first two ships were loaded with wheat from the terminal elevator at Churchill. Since that time trade out of the port has gradually increased, and in the shipping season of 1959 a total of 59 ships took out nearly 22,000,000 bushels of wheat. In the same year, imports consisted of about 6,000 tons of general cargo from overseas, 37,000 tons of petroleum products

Table 5
Softwood and Hardwood Volume by Inventory Blocks and Size Classes
Inaccessible Forest Zone—Provincial Crown Land

Inventory Blocks	VOLUME IN CUNITS (100 cu. ft. Units)								
	Softwood			Hardwood			TOTAL		
	4'' - 9'' D.B.H.*	10'' + D.B.H.*	Total	4'' - 9'' D.B.H.*	10'' + D.B.H.*	Total	4'' - 9'' D.B.H.*	10'' + D.B.H.*	Total
EASTERN DIVISION									
Bear Lake.....	866,929	216,784	1,083,713	71,951	11,557	83,508	938,880	228,341	1,167,221
Bigstone Lake.....	2,369,737	663,351	3,033,088	393,487	72,964	466,451	2,763,224	736,315	3,499,539
Family Lake.....	2,276,932	554,813	2,831,745	341,506	65,471	406,977	2,618,438	620,284	3,238,722
Gods Lake.....	1,523,770	449,077	1,972,847	304,171	56,225	360,396	1,827,941	505,302	2,333,243
Gunisao Lake.....	2,845,362	719,825	3,565,187	322,979	64,884	387,863	3,168,341	784,709	3,953,050
Island Lake.....	4,165,407	1,204,359	5,369,766	1,032,901	202,889	1,235,790	5,198,308	1,407,248	6,605,556
Knee Lake.....	367,195	99,417	466,612	29,221	4,568	33,789	396,416	103,985	500,401
Molson Lake.....	1,808,895	462,008	2,270,903	164,710	27,137	191,847	1,973,605	489,145	2,462,750
Oxford House.....	2,577,502	726,888	3,304,390	358,495	62,445	420,940	2,935,997	789,833	3,725,330
Red Sucker Lake.....	1,450,183	382,388	1,832,571	170,384	30,116	200,500	1,620,567	412,504	2,033,071
Upper Poplar Lake.....	1,315,394	361,347	1,676,741	178,843	72,814	251,657	1,494,237	434,161	1,928,398
Walker Lake.....	2,750,074	718,349	3,468,423	305,511	51,982	357,493	3,055,585	770,331	3,825,916
TOTAL.....	24,317,380	6,558,606	30,875,986	3,674,159	723,052	4,397,211	27,991,539	7,281,658	35,273,197
PERCENTAGE.....	78.8	21.2	100.0	83.6	16.4	100.0	79.4	20.6	100.0
NORTHERN DIVISION									
Barrington Lake.....	437,007	106,638	543,645	29,412	4,849	34,261	466,419	111,487	577,906
Burntwood East.....	1,037,969	288,475	1,326,444	172,670	31,814	204,484	1,210,639	320,289	1,530,928
Burntwood West.....	1,711,715	446,290	2,158,005	240,027	46,755	286,782	1,951,742	493,045	2,444,787
Highrock Lake.....	1,312,022	375,582	1,687,604	268,687	50,449	319,136	1,580,709	426,031	2,006,740
Nelson House.....	1,508,531	426,415	1,934,946	298,628	54,991	353,619	1,807,159	481,406	2,288,565
Reindeer Lake.....	104,064	24,500	128,564	15,130	2,530	17,660	119,194	27,030	146,224
South Indian Lake.....	552,308	147,106	699,414	48,977	7,886	56,863	601,285	154,992	756,277
Spit Lake.....	1,076,544	284,070	1,360,614	141,176	23,562	164,738	1,217,720	307,632	1,525,352
TOTAL.....	7,740,160	2,099,076	9,839,236	1,214,707	222,836	1,437,543	8,954,867	2,321,912	11,276,779
PERCENTAGE.....	78.7	21.3	100.0	84.5	15.5	100.0	79.4	20.6	100.0
TOTAL INACCESSIBLE FOREST ZONE—PROVINCIAL CROWN									
GRAND TOTAL.....	32,057,540	8,657,682	40,715,222	4,888,866	945,888	5,834,754	36,946,406	9,603,570	46,549,976
PERCENTAGE.....	78.7	21.3	100.0	83.8	16.2	100.0	79.4	20.6	100.0

*D.B.H. is an abbreviation for diameter at breast-height; trees are measured, outside the bark, at 4½ ft. above the ground.

MERCHANTABLE AREA AND MERCHANTABLE VOLUME BY DIVISIONS

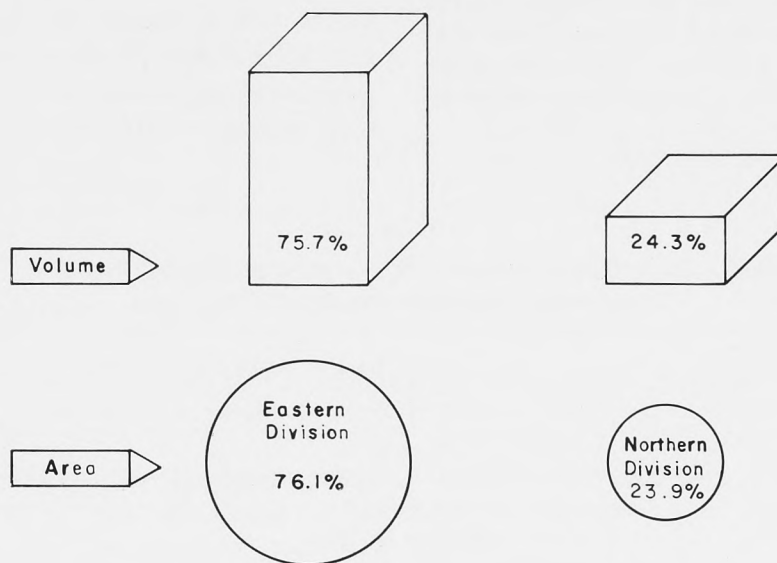


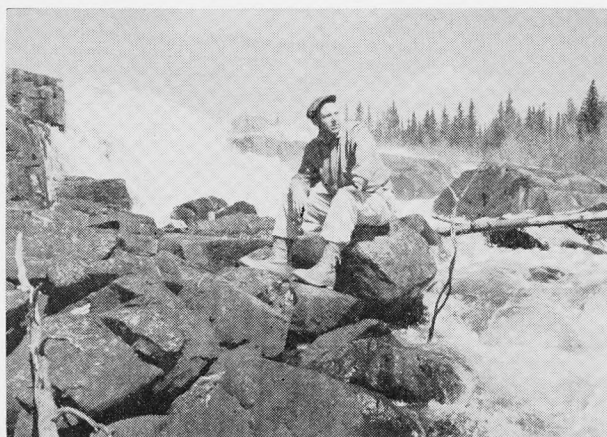
Figure 5

and 23,000 tons of nickel-copper concentrate, the latter being enroute from a mine at Rankin Inlet on Hudson Bay to a refinery in Alberta.

The main pressure which led to the construction of the Hudson Bay Railway came from the agricul-

tural interests of Manitoba and Saskatchewan, hoping to get a cheaper outlet for farm products than was available over the long haul to the Atlantic seaboard, and little thought was given, at least in the beginning, to the development of the natural resources of the Precambrian and ancient Palaeozoic areas which the railway would cross. As it happened, the line has been an important factor in the development of the mineral and other natural resources of the north.

Little use has been made as yet, of the forest resources of the Inaccessible Area. This, of course, is understandable, when it is realized that the utilization of wood depends on transportation routes to distant markets; on the existence of local markets for partially manufactured material, such as lumber and mining timber; or, on the establishment in the locality of wood-using industries capable of concentrating the raw material wood into forms which can be economically shipped out, for instance, as wood pulp, paper, chemical products, etc.



Falls on Burntwood River.

The best hope for forestry development in the presently inaccessible areas seems to be tied up with the possibility of new and large scale mineral deposits being located. The discovery, and later, the development of such deposits in the past, at

Flin Flon, Sherridon, Snow Lake, Lynn Lake, and Thompson, has already resulted in the construction of branch line railways to these points, and to very considerable use of the forest products of these areas—see Forest Inventory reports, Nos. 5, 6 and 7.

Table 6
Softwood and Hardwood Volume by Species and Size Classes
Inaccessible Forest Zone—Provincial Crown Land

Species	*CUNITS BY DIAMETER CLASSES						†SAW TIMBER 10'' +
	TOTAL		4'' - 9'' D.B.H.		10'' + D.B.H.		
	<i>volume</i>	<i>per cent</i>	<i>volume</i>	<i>per cent</i>	<i>volume</i>	<i>per cent</i>	
EASTERN DIVISION							
White spruce.....	4,577,164	13.0	1,739,322	6.2	2,837,842	39.0	1,277,029
Black spruce.....	20,850,960	59.1	18,143,498	64.9	2,707,462	37.2	1,218,358
Balsam fir.....	1,165,952	3.3	958,487	3.4	207,465	2.8	93,359
Jack pine.....	4,281,910	12.1	3,476,073	12.4	805,837	11.1	362,627
TOTAL SOFTWOOD.....	30,875,986	87.5	24,317,380	86.9	6,558,606	90.1	2,951,373
Poplar.....	3,161,710	9.0	2,637,469	9.4	524,241	7.2	235,908
White birch.....	1,235,501	3.5	1,036,690	3.7	198,811	2.7	89,465
TOTAL HARDWOOD.....	4,397,211	12.5	3,674,159	13.1	723,052	9.9	325,373
TOTAL ALL SPECIES.....	35,273,197	100.0	27,991,539	100.0	7,281,658	100.0	3,276,746
NORTHERN DIVISION							
White spruce.....	1,498,618	13.3	585,905	6.5	912,713	39.3	410,721
Black spruce.....	6,827,040	60.6	5,924,090	66.1	902,950	38.9	406,328
Balsam fir.....	384,713	3.4	328,323	3.7	56,390	2.4	25,375
Jack pine.....	1,128,865	10.0	901,842	10.1	227,023	9.8	102,160
TOTAL SOFTWOOD.....	9,839,236	87.3	7,740,160	86.4	2,099,076	90.4	944,584
Poplar.....	1,037,866	9.2	877,103	9.8	160,763	6.9	72,343
White birch.....	399,677	3.5	337,604	3.8	62,073	2.7	27,933
TOTAL HARDWOOD.....	1,437,543	12.7	1,214,707	13.6	222,836	9.6	100,276
TOTAL ALL SPECIES.....	11,276,779	100.0	8,954,867	100.0	2,321,912	100.0	1,044,860
TOTAL INACCESSIBLE FOREST ZONE—PROVINCIAL CROWN							
White spruce.....	6,075,782	13.1	2,325,227	6.3	3,750,555	39.1	1,687,750
Black spruce.....	27,678,000	59.5	24,067,588	65.2	3,610,412	37.6	1,624,686
Balsam fir.....	1,550,665	3.3	1,286,810	3.5	263,855	2.7	118,734
Jack pine.....	5,410,775	11.6	4,377,915	11.8	1,032,860	10.8	464,787
TOTAL SOFTWOOD.....	40,715,222	87.5	32,057,540	86.8	8,657,682	90.2	3,895,957
Poplar.....	4,199,576	9.0	3,514,572	9.5	685,004	7.1	308,251
White birch.....	1,635,178	3.5	1,374,294	3.7	260,884	2.7	117,398
TOTAL HARDWOOD.....	5,834,754	12.5	4,888,866	13.2	945,888	9.8	425,649
TOTAL ALL SPECIES.....	46,549,976	100.0	36,946,406	100.0	9,603,570	100.0	4,321,606

*One cunit equals 100 cubic feet of wood; one cord equals 85 cubic feet of wood.

†Saw-timber figures were obtained by converting the cubic foot volume of the size class, 10" D.B.H. and over, to board feet on the assumption that one cubic foot is equal to 4.5 board feet.

COMPARISON OF SOFTWOOD TO HARDWOOD VOLUME BY DIVISIONS

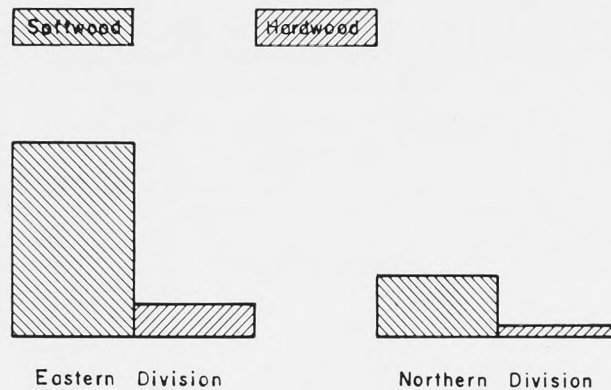


Figure 6

Judging by the presently mapped areas of potential mineral deposition in the Inaccessible Area, and the increasing use of geophysical methods of detecting ore-bodies concealed by drift, vegetation, or water, there is a good prospect that new mineral deposits will be discovered of such size that railway construction is warranted; in which case, new forest areas will be opened up at the same time.

Some of the belts of greatest promise for future mineral development are to be found northwest of the Hudson Bay Railway— in areas north of Lynn Lake, in the Reindeer Lake area, along the Rat River, at Assean Lake, along the Seal River, and in the Mystery-Moak Lake area. Similar belts southeast of the railway occur along the Fox-Bigstone rivers, in the vicinity of Oxford Lake, at Gods, Island, Stevenson, and Knee lakes, and along the Echimamish and Carrot rivers.

Up to date, only two mines in the Inaccessible Forest Zone have reached the production stage, these being the God's Lake Gold Mine which operated between 1935 and 1943 and produced about \$6,000,000 in gold, and the Island Lake Mine which produced a small amount of gold in 1934 and 1935.

In December, 1956, the International Nickel Company, after years of exploration and proving up, announced their decision to develop mines at Thompson and Moak lake. The project, it is understood, will constitute the biggest nickel-producing operation in the world, next to Inco's operations in the Sudbury District of Ontario, and will be, when completed, the only fully integrated nickel operation in the world, as both smelting and refining will be done at the mine site. A railway line has been built to connect with the Hudson Bay Railway. The mill, smelter, and townsite are well advanced and it is expected that the smelter will commence production in 1960.

Northern Manitoba has abundance of hydro-electric power awaiting development, so that as soon as the International Nickel Company's project became a certainty the Manitoba Hydro-Electric Board was able to commence construction of a power plant at Kelsey on the Nelson River, distant about 60 miles from Thompson in a northeasterly direction. The ultimate capacity at this site may be as high as 300,000 kilowatts, which is sufficient for full development of the nickel project, leaving an ample plus capacity for a pulp and paper mill of

500 tons daily capacity or larger, if and when required.

Lower down the Nelson there are eight other potential power sites with a combined capacity of 1,750,000 kilowatts—power sites upstream from Kelsey have already been referred to in Inventory Report No. 6, Nelson River. The Churchill River has 10 sites with a potential of 750,000 kilowatts, while the Seal River further north can develop 115,000 kilowatts. Smaller sites are also available on the Burntwood and Grass rivers.

Very little investigation has been carried out in the eastern area but power sites on the Hayes River and its tributaries could be developed if required. A small plant was built at Kanuchuan Rapids on the Island Lake River and was used for a time to supply power to the God's Lake Gold Mine. Small sites could be developed on some of the rivers which flow into Lake Winnipeg from the east, especially the Pigeon, Berens, and Poplar.

The fur trade continues to be an important industry, as indeed it has been for around 300 years. Production has varied greatly with changes in fashions, and in the past there was a tendency to trap an area out when the demand was high, leaving very little breeding stock. An important step

in conservation was made when the registered trap-line system was initiated. Under this system, the trapper who has been awarded the sole right to harvest fur from a definite area, has, as a result, been given the incentive to manage his fur crop so that the breeding stock is maintained or built up.

Registered trap-lines were first initiated in 1940 and since then have been extended over the whole area of Northern Manitoba. As evidence of the success of the system, the figures for the annual production of beaver pelts in Manitoba are of interest. During the first few years, the increase was slow and no trapping could be allowed; by 1944-45, with the natural increase, and with the help of transplanting from areas of abundance to poorly stocked areas, limited trapping was allowed. Since that time, namely in the last 15 years, the take of beaver in Manitoba has increased to around six times what it was in the beginning of the period. With the increase of beaver, other fur-bearing animals have increased, notably mink, which is now the most important fur-bearer in Manitoba.

Wolverine, martin, and fisher are now found only in the north, although they formerly were found further south. White fox, Arctic hares, and polar bears are true Arctic animals and are taken only

Table 7
Area Classification in Acres—Uncruised Inaccessible Area

Subdivision	Productive Forest			Potentially Productive Forest	Nonproductive Forest	Permanently Nonforested Land	TOTAL LAND
	Unmerchantable	Merchantable	SUBTOTAL				
FOREST ZONE							
Indian Reserves.....	34,433	12,073	46,506	408	39,144	4,956	91,014
SUBTOTAL.....	34,433	12,073	46,506	408	39,144	4,956	91,014
TRANSITION AND TUNDRA							
Provincial Crown.....	.....	.....	.....	.....	22,003,426	29,390,361	51,393,787
Indian Reserves.....	.....	.....	.....	.....	4,574	6,137	10,711
SUBTOTAL.....	.....	.....	.....	.....	22,008,000	29,396,498	51,404,498
SUMMARY OF UNCROISED INACCESSIBLE AREAS							
Provincial Crown.....	.....	.....	.....	.....	22,003,426	29,390,361	51,393,787
Indian Reserves.....	34,433	12,073	46,506	408	43,718	11,093	101,725
TOTAL.....	34,433	12,073	46,506	408	22,047,144	29,401,454	51,495,512



Winter scene in the north.

Table 8

*Area Classification of Productive Forest by Cover Type and Merchantability
Uncruised Inaccessible Area*

Subdivision	COVER TYPES IN ACRES											
	Softwood			Mixedwood			Hardwood			TOTAL		
	Unmerch.	Merch.	SUBTOTAL	Unmerch.	Merch.	SUBTOTAL	Unmerch.	Merch.	SUBTOTAL	Unmerch.	Merch.	TOTAL
FOREST ZONE												
Indian Reserves....	24,569	9,574	34,143	5,223	2,084	7,307	4,641	415	5,056	34,433	12,073	46,506
SUBTOTAL.....	24,569	9,574	34,143	5,223	2,084	7,307	4,641	415	5,056	34,433	12,073	46,506
TRANSITION AND TUNDRA ZONE												
Provincial Crown..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Indian Reserves....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SUBTOTAL.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SUMMARY OF UNCROISED INACCESSIBLE AREAS												
Provincial Crown..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Indian Reserves....	24,569	9,574	34,143	5,223	2,084	7,307	4,641	415	5,056	34,433	12,073	46,506
TOTAL.....	24,569	9,574	34,143	5,223	2,084	7,307	4,641	415	5,056	34,433	12,073	46,506

COMPARISON OF SAWTIMBER TO CORDWOOD VOLUME FOR SOFTWOOD AND HARDWOOD

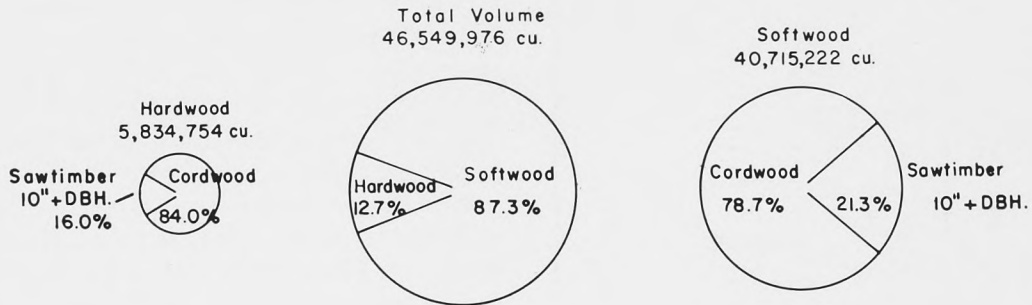


Figure 7

in the tundra and along the shores of Hudson Bay. Fur-bearing animals found in the north and also in the south include beaver, muskrat, lynx, skunk, mink, weasel, red fox, and its varieties, black bear, and timber wolf.

Moose range throughout the Forest Zone and a considerable distance into the Transition Zone; woodland caribou are found throughout most of the Forest Zone; barren ground caribou migrate back and forth, spending the summer in the tundra of the Northwest Territories, and coming south into the wooded areas in the winter.

Ducks and geese nest throughout Northern Manitoba; ptarmigan and spruce grouse are found in most sections.

Fish from the numerous lakes and rivers of the north country supply an important part of the food of the local inhabitants, and many of these people are employed in commercial fishing operations during the summer and winter open seasons. Commercial fishing is carried on in many of the lakes as far north as Reindeer, Southern Indian, and Knee lakes. The fish are packed in ice and flown out, or, in some cases, taken out to the railway over winter roads by snowmobile. The most important species of fish taken from northern lakes for commercial purposes are whitefish, pickerel (walleye), northern

pike, lake trout, tullibee, and goldeye, in that order. The beluga, or white whale, is harpooned in the coastal waters of Hudson Bay and taken to a plant at Churchill where the blubber is processed and whale oil extracted.

The river-cut and lake-dotted northland is gradually being discovered by sport fishermen who come in by canoe, float-equipped plane, or by the Hudson Bay or Lynn Lake railways. Most of the lakes yield lake trout, pickerel (walleye), and northern pike. Brook trout are found in the Hayes River area (notably around Gods Lake), and in the Limestone and Weir rivers which cross the Hudson Bay Railway north of the Nelson. Arctic grayling are taken in the lower reaches of the rivers from the Nelson northward and also in the northwest corner of the province at Reindeer Lake and northward. Arctic char occur in the estuaries and lower reaches of streams flowing into Hudson Bay, from Churchill northward.

The population of the area covered by this report is approximately 13,000, of which 5,000 are Indians. The white population is mainly concentrated at Churchill and at the new nickel centre—Thompson.

At the present time the most important fur-trading centres and Indian settlements are: Brochet, situated at the north end of Reindeer Lake; Nelson

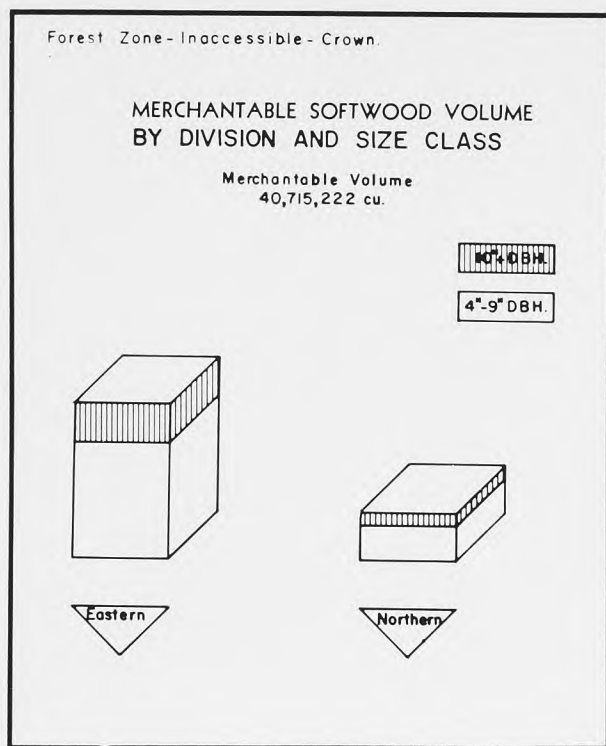


Figure 8

House and Southern Indian Lake located northwest of the Hudson Bay Railway; Oxford House, Gods Lake, and Shamattawa, southwest of the railway; Island Lake on the large lake of the same name; and Little Grand Rapids, on the upper Berens River, near the Ontario boundary.

Highways are beginning to reach into the so-called Inaccessible Area, as indicated in Map No. 2. Construction is underway on a road which will connect Thompson with the southern highway sys-

tem. Another highway, now in the planning stage, will run eastward from this road with Gods Lake as the intended terminus.

Forest Administration

Fire protection is the most important phase of forestry work in this inaccessible area. Much of the forest is young, having suffered from widespread fires in the not very distant past. This young growth is, nevertheless, of great potential value, on the assumption that the area will be opened up for forest cropping by the time the timber is mature.

Some degree of fire protection has been in effect in this area since aircraft were first used in 1921, and the fire protection organization has been gradually improved since that date. A preliminary attempt at fire zoning has been made, based on forest values and accessibility. Briefly, the more accessible productive areas have about as good fire protection as the difficulties of transportation allow. In periods of high fire incidence, fire-fighting in the less valuable and accessible areas has to be confined to attempts at suppressing small fires before they spread, leaving the large fires alone, until the situation in the more valuable areas has been brought under control.

The District Forester, Northern Forest District, with headquarters at The Pas, is responsible for forest administration of the whole Inaccessible Forest Area, with the exception of the two most southerly inventory units—Family Lake and Upper Poplar. These last two units are more conveniently handled by a Forest Ranger located at Lac du Bonnet, who is responsible to the District Forester, Eastern Forest District.



Big ridge at Baldock Lake.

Table 9

Softwood and Hardwood Volume by Size Classes—Uncruised Inaccessible Area

Subdivision	VOLUME IN CUNITS (100 cu. ft. Units)								
	Softwood			Hardwood			TOTAL		
	4" - 9" D.B.H.	10" + D.B.H.	SUBTOTAL	4" - 9" D.B.H.	10" + D.B.H.	SUBTOTAL	4" - 9" D.B.H.	10" + D.B.H.	TOTAL
FOREST ZONE									
Indian Reserves.....	51,144	11,549	62,693	5,481	1,330	6,811	56,625	12,879	69,504
SUBTOTAL.....	51,144	11,549	62,693	5,481	1,330	6,811	56,625	12,879	69,504
TRANSITION AND TUNDRA ZONE									
Provincial Crown.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Indian Reserves.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SUBTOTAL.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SUMMARY OF UNCROISED INACCESSIBLE AREAS									
Provincial Crown.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Indian Reserves.....	51,144	11,549	62,693	5,481	1,330	6,811	56,625	12,879	69,504
TOTAL.....	51,144	11,549	62,693	5,481	1,330	6,811	56,625	12,879	69,504

Permanent staff forest rangers located at Sheridon, Snow Lake, Thicket Portage, Norway House, and Lac du Bonnet have districts which include accessible forest areas adjacent to their headquarters and a hinterland of inaccessible forest. These forest rangers are assisted during the summer months by a seasonal staff, supplemented as required by locally recruited fire-fighting crews. Steel lookout towers, all equipped with radio sets for communication with adjoining towers and with headquarters, are located at Nelson House, Gods Lake, Island Lake, Stevenson Lake, Little Grand Rapids, and Sasaginnigak Lake, in the inaccessible area and these towers are co-ordinated with adjoining towers in the accessible area.

The Manitoba Government Air Service, with main bases at Lac du Bonnet and The Pas, and summer bases at Norway House and Thicket Portage, supplies aircraft for fire patrol and for the transportation and supplying of fire suppression crews.

Area Classification and Forest Composition

Tables 2 and 3 give the area classification, and Tables 4 to 6 the wood volumes for the 26,705,713

acres of land area actually cruised. It will be seen that 51.2 per cent of the land area is under productive forest. Of the merchantable wood volume, 87.5 per cent consists of coniferous species and 12.5 is hardwood. Black spruce is the leading species with 59.5 per cent of the total volume; followed by white spruce, 13.1%; jack pine, 11.6%; poplar, 9.0%; white birch, 3.5%; and balsam fir, 3.3%. A negligible volume of tamarack was recorded.

Tables 7 to 10 give estimated figures for the 51,495,512 acres of uncruised land.

Forest Inventory

As a glance at Map No. 1 will show, the Inaccessible Forest area is divided into three sections by extensions of the Accessible Forest along the Hudson Bay and Lynn Lake Railways. The inaccessible area west of the Lynn Lake Railway is small, covering about 12 townships, and, for convenience in summarizing, may be included with the large area northwest of the Hudson Bay Railway, designated Northern Division. The area southeast of the Hudson Bay Railway extending to the Ontario boundary and southward has been designated Eastern Division.

MERCHANTABLE HARDWOOD VOLUME BY DIVISION AND SIZE CLASS

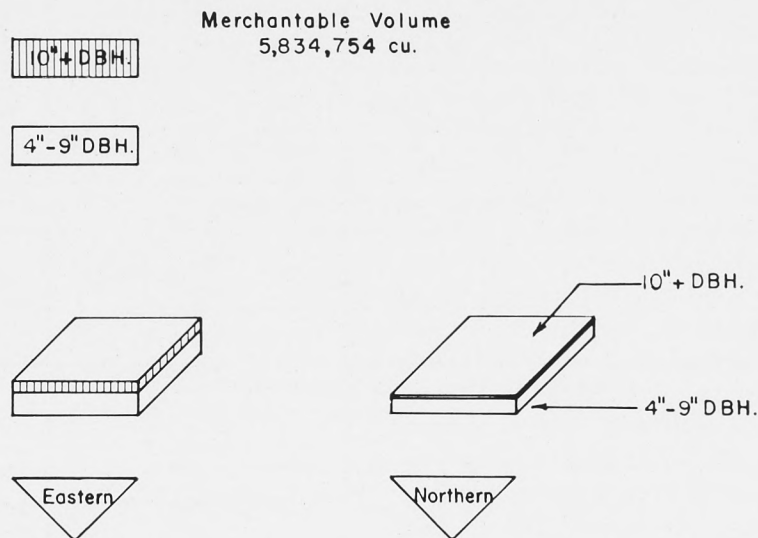


Figure 9

Good control for mapping from aerial photographs was furnished by the Dominion Land Survey system of base lines where these lines were available. These base lines are intended to be run in an east and west direction at approximately 24 mile intervals, i.e. at four township intervals. The 1st base line forms the International Boundary along the southern edge of the province; the 2nd base line forms the north boundary of township 4; the 3rd is north of township 8, and so on northward. Since the Inaccessible forest zone reaches in a north and south direction from the north boundary of township 26 to the north boundary of township 92, it will ultimately be crossed by base lines 8 to 23, and will be bounded on the north (in part) by the 24th base line.

Although a good deal of base line and other control was available from past surveys before the initiation of the forest inventory, it was still necessary to fill in a good many gaps. This work was done by the provincial Surveys Branch, which ran a total of

332 miles of new base lines and meridians and 343 miles of chained traverse, during the winters of 1951-52 to 1954-55, the main portion of these lines being in the Inaccessible Forest Zone.

In the Northern Division, the 18th base line (which forms the southern boundary) and the 23rd base line were in existence at the time of the initiation of the forest inventory, also parts of the 21st and 22nd. In order to supply sufficient control to tie in the forest inventory aerial photographs, the provincial Surveys Branch extended the 20th and 22nd base lines westward across the area. These base lines, together with certain chained traverses along the northern margin, at about 48 mile intervals, supplied control for the north and south photographic flights.

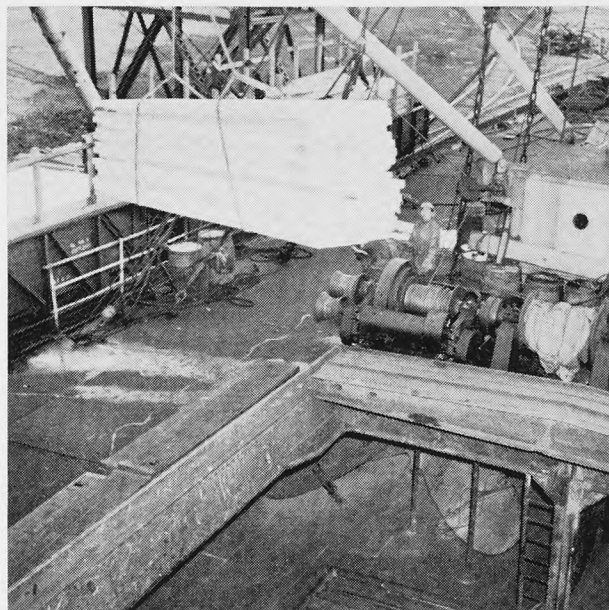
In the Eastern Division, no pre-inventory east and west control lines were available between the 7th base line which lies 6 miles south of the southern margin of the area and the 18th, a distance of

over 265 miles. To fill this gap, the Surveys Branch ran chained traverses in the general vicinity of where the 11th, 13th, and 15th base lines will ultimately be located. These traverses were run in the winter when lakes, rivers, and marshes could be crossed on the ice. The most southerly traverse ran eastward along a winter tractor road, starting at Berens River; the centre line followed the course of the Mukutawa and Cobham rivers from the vicinity of Lake Winnipeg to the Ontario boundary; the northern traverse commenced near Norway House and followed a winter road to Island Lake.

The control lines outlined above, together with the previously run 21st base line in the north, furnished control at intervals of from 48 to 72 miles. Additional control was supplied by the Ontario boundary to the east.

Part of the area had been covered by vertical aerial photography, at a scale of 1:36,000, in the summers of 1950 and 1951. The balance of the area was covered in 1952 under special contract with a private company, the scale in this case being 1:31,680.

Base mapping was done by the Provincial Surveys Branch, by the slotted template method, at a scale of 1:31,680. A base map consisted simply of a large sheet of paper, showing township outlines, and also centre points and pass points of the photos used.



—Dept. of Industry and Commerce

Loading lumber aboard ship at Churchill.

When the forest survey of this large area was considered it soon became obvious that something simpler than the method used in the Accessible Area would have to be devised. For one reason, the photographs were on a smaller scale; for another, the timber being inaccessible would not justify the expense of a more detailed survey. After consider-

Table 10
Volume by Species and Size Classes—Uncruised Inaccessible Area

Species	*CUNITS BY DIAMETER CLASSES						†SAW- TIMBER 10'' and Over
	TOTAL		4'' - 9'' D.B.H.		10'' and Over D.B.H.		
	<i>volume</i>	<i>per cent</i>	<i>volume</i>	<i>per cent</i>	<i>volume</i>	<i>per cent</i>	<i>M ft. b.m.</i>
INDIAN RESERVES							
Spruce.....	51,784	74.5	42,152	74.4	9,632	74.8	4,334
Balsam fir.....	2,320	3.3	1,905	3.4	415	3.2	187
Jack pine.....	8,589	12.4	7,087	12.5	1,502	11.7	676
TOTAL SOFTWOOD.....	62,693	90.2	51,144	90.3	11,549	89.7	5,197
Poplar.....	4,856	7.0	3,934	7.0	922	7.1	415
White birch.....	1,955	2.8	1,547	2.7	408	3.2	184
TOTAL HARDWOOD.....	6,811	9.8	5,481	9.7	1,330	10.3	599
TOTAL ALL SPECIES.....	69,504	100.0	56,625	100.0	12,879	100.0	5,796

*One cunit equals 100 cubic feet of wood; one cord equals 85 cubic feet of wood.

†Saw-timber figures were obtained by converting the cubic foot volume of the size class, 10" D.B.H. and over, to board feet on the assumption that one cubic foot is equal to 4.5 board feet

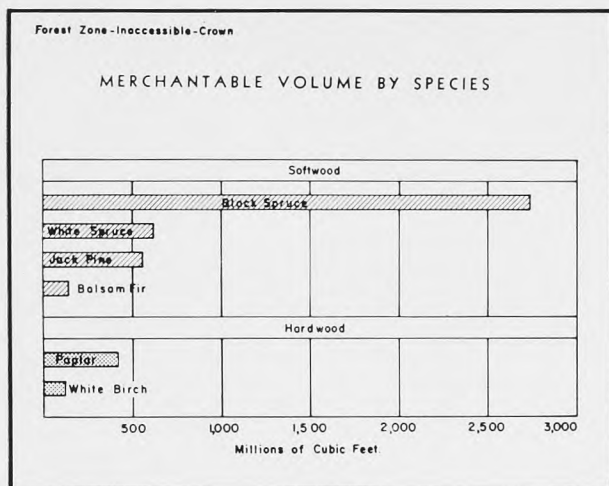


Figure 10

able preliminary research a method of forest survey suitable for the area was adopted.

In this method, named the Township Grid System, points on the base map were marked at approximately one mile intervals, i.e., at the centre of each theoretical section. These points were transferred to the photographs and served as the centre of plots to be interpreted from the aerial photograph, or on the ground, as the case might be. The plots as marked on the photograph were circular and 0.12 inches in diameter, which would correspond to a two acre plot on the ground.

Experimental field work was done in the summer of 1954: one two-man party working in the Oxford House and Burntwood River areas and a second at Family Lake and the upper Poplar River. In 1955, three two-man parties were in the field with a forester in general supervision. An eastern party covered the Bigstone, Island, Gods, and Knee lake blocks; the central party worked north through the Gunisao, Molson, Walker, Bear, and Split lake blocks; the western party covered Highrock, Barington, and Southern Indian lakes, also Nelson House. The survey parties were serviced by air and camps were usually moved in the same manner; for local work, the parties used canoe and outboard motor. In addition to ground checking, the party chiefs viewed less accessible areas by aerial reconnaissance. Out of the 20 inventory blocks into which the whole area was divided, all but two were visited by ground checking parties.

A total of 455 sample plots with merchantable timber were located on the ground and tallied; the

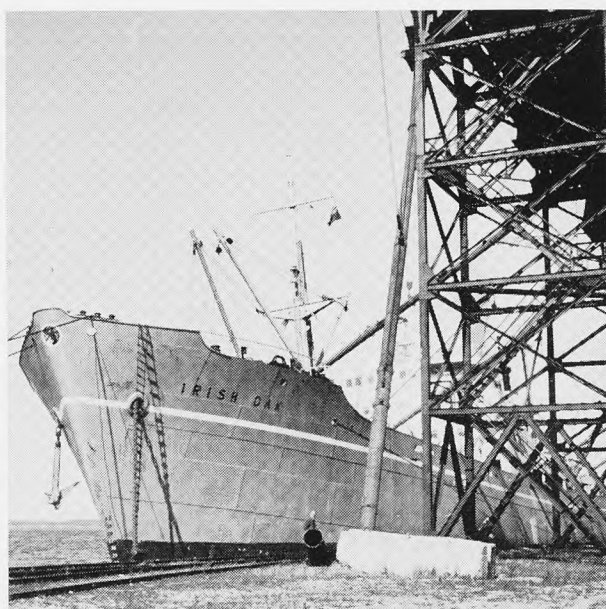
number of non-tallied plots inspected on the ground amounted to 757; the total number of plots visited amounted to 1,212. See Survey Methods in Appendix.

Plots not checked on the ground were interpreted from aerial photographs. A simplified system of typing was used, including four merchantable types, three young growth types, and a potentially productive type, or a total of eight productive forest types. In addition, there were two nonproductive types, wet and dry; two nonforested types, wet and dry, and a water type, or a total of 13 types.

Areas of types by blocks were calculated by counting the number of plots of each type and calculating the proportion which this figure bore to the total area, thus eliminating much laborious planimetry. The average block had an area of 1,500,000 acres with about 2,400 plots, and assuming the accuracy of the interpretation, the resulting area calculations should be reasonably accurate.

On compilation of the field work, the data collected was used to prepare tree volume and type volume tables, the whole Inaccessible Area being treated as a unit. In the final compilation of area and volume, a division was made into 20 inventory units, or blocks, and separate figures were given for each.

Forest maps on a scale of two inches to one mile were prepared in four township units. These maps



Loading wheat at Churchill.



Head frame and concentration plant, International Nickel Co., Thompson. —Dept. of Industry and Commerce

did not show type boundaries except for water, but did indicate by symbol the type at each plot.

Forest Utilization

Until recently the forests of the north have supplied limited quantities of building logs, lumber, and firewood, only to the local Indian Reserves, fur-trading posts, and church missions. When a mining operation opens up, the situation changes, and lumber, etc., is required in large quantities on the spot and in short order. For example, at Gods Lake during the period of gold mining activity 2,000,000 board feet of lumber was cut and used as well as 15,000 cords of fuelwood for heating and power purposes, nearly one-quarter of a million lineal feet of mining timber, and 1,500 telephone and power line poles. When a nickel-copper mining operation started at Lynn Lake, a portable sawmill was set up at Granville Lake to supply lumber for the new mining town.

The new mining development of International Nickel Company at Thompson is already using large quantities of local mining timber, partly in

the round, but much of it sawn and shaped by a framing mill. Large quantities of lumber are also required annually by the mine, and while to date most of this has been shipped in from outside the area, it is certain that in a few years local sawmills will be able to supply much of the demand.

Forest Inventory Report No. 6 — Nelson River Forest Section, refers to the possibility of a pulp and paper mill being established at a point on Sipiwesk Lake, the mill to draw its wood requirements from the districts along the Nelson River and Hudson Bay Railway. The existence of such a mill, coupled with the railway line already built to Thompson, would bring a considerable forest area northwest of the Hudson Bay Railway (now mapped as inaccessible) within economic distance for hauling or floating pulpwood to this market. The inventory blocks most affected would be: Burntwood East, Burntwood West, and Nelson House to the northwest. To the east and south of the Nelson River, the inventory blocks named Bear Lake and Walker Lake would also become accessible at the same time. See Map No. 2.

Appendix

SURVEY METHODS

The Township Grid

A standard grid was drawn to approximately fit all townships with a scale of 2,640 feet to one inch. A point was taken in the centre of each section to represent a two acre plot with a diameter of 0.12 inches. This grid was photographed and printed to scale on dimensionally stable material as Photo Aid No. 5.

Types Used in Inaccessible Forest Survey

S.M.-1: Softwood Merchantable Spruce

A stand with the crown cover consisting of 75% or more softwood of which 40% of the softwood is spruce or balsam. The average height of the stand is 30 feet or over.

S.M.-2 Softwood Merchantable Jack Pine

A stand with the crown cover consisting of 75% or more softwood of which 60% or over of the softwood is jack pine. The average height of the stand is 30 feet or over.

M.M.: Mixedwood Merchantable

A stand with the crown cover made up of from 25 to 75% hardwood and the average height of the stand 30 feet or over.

H.M.: Hardwood Merchantable

A stand with the crown cover consisting of 75 to 100% hardwood and the average height of the stand 30 feet or over.

S.Y.: Softwood Young

A stand with the crown cover consisting of 75 to 100% softwood and the average height less than 30 feet. (It was considered impractical to attempt to separate young jack pine from young spruce on 2,640 feet to one inch photos.)

M.Y.: Mixedwood Young

Similar to M.M. except the average height is less than 30 feet.

H.Y.: Hardwood Young

Similar to H.M. except that the average height is less than 30 feet.

P.: Potential Forest Land

Areas not supporting forest cover at present but capable of producing trees in the near future.

F.R.: Treed Rock or other dry areas with trees which at maturity will not exceed 30 feet in height.

F.W.: Treed Wet Waste

Wet areas with trees which at maturity will not exceed 30 feet.

R.: Dry Waste

Rock ridges, rock outcrops, and other dry areas incapable of producing trees.

W.: Wet Waste incapable of growing trees.

L.: Water

Lakes and rivers.

Procedure Prior to Field Checking

1. Place the tracing paper base map over the grid (Photo Aid No. 5) and using a drop compass transfer the plots from the grids to the base maps. (The centre of the X is the centre of the plot.)

2. Before sketchmastering a particular area, the photos for this area should be examined with a stereoscope and lakes and streams outlined with red ink. This is especially important where the photos were taken in early spring and the lakes are not completely free from ice.

3. Transfer the topography to the base map from the photos using a vertical sketchmaster, and then as part of the same operation, transfer the plots from the base map to the photos. (Plots should be 0.12 inches in diameter on photos.) This is an important step and care should be taken to see that the plots are transferred accurately, i.e., in exactly the same position on the photos as on the base map.

4. In planning for the summer work decide which lakes would be the most advantageous to visit. To do this, the photos should be examined and the lakes selected using the following as a guide:

- (a) Number of plots accessible from lake.
- (b) Percentage of productive land.
- (c) Variety of types around lake.
- (d) Location of lake, i.e., visit lakes in all parts of the area. Don't concentrate the whole field season on lakes in only one part of the area.

5. Decide which plots should be checked on the ground and number these plots on the photos. (The individual plot is indexed by the section on which it falls.)

6. Write township and range number on photos.

7. Draw a north-south line on each photo that has accessible plots.

By carrying out steps 5, 6, and 7 in the office all data necessary for filing field work will be on the photos.

Field Procedure

1. For training purposes photo interpret plots, which are to be ground checked, and enter in appropriate places on Type Description sheets.

2. Locate the mechanically established plot as accurately as possible on the ground.

3. If average height of the stand is over 30 feet, cruise a 1/20th acre plot (2 chains by 1/4 chain) through the centre of the plot in a direction approximately at right angles to the shore line or river bank away from the shore. Tally by species, all trees in 4" D.B.H. class and upward.

4. Determine the cover type, e.g., SM-1, SM-2, M.H. or H.M.

5. If stand is merchantable, take ten height-diameter-age measurements in dominant and co-dominant height classes of predominant species in approximately the same proportion as they occur in the stand.

6. Sufficient form class measurements should be taken to enable a correct volume table to be made, also to determine whether form class changes with latitude. Ten to fifteen form class measurements should be taken on each lake or about 100 measurements per party for the summer.

7. If the plot falls in young growth, the age should be determined and a stem count by species taken. The stem count may be done by counting the trees on four milacre quadrats taken at random throughout the stand. Enter type symbol SY, MY, or HY.

8. If plot is not productive, record the approximate type symbol—P, FR, FW, R, W, or L.

9. On completion of the work on a lake or river, a report should be written covering

(a) History of the area:

i. Description of stands (Species, growth, etc.).

ii. Damage to stand by fire, insect, and disease.

(b) Soil and topography.

(c) Future of area from economic standpoint.

(d) List of shrubs and herbs seen.

10. If large portions of the area are inaccessible by canoe, a reconnaissance flight by plane over the area should be made and types noted on photos. This will be a valuable aid in photo-interpretation.

Procedure Following Field Season

1. Photo-interpretation and Forest Maps

(a) With red ink or a red pencil write the type symbol of the plots checked in the field, on the base map, adjacent to the appropriate circular plot.

(b) Photo-interpret the remainder of the plots and write symbols on the base maps using some color pencil other than red. In photo-interpreting a plot which occurs on the border line between two types, the type which occupies over 50% of the plot is the one chosen. The photo-interpreter should be concerned only with what falls inside the plot. He should not allow conditions surrounding the plot to influence his decision.

(c) Once typing and photo-interpretation has been completed, and all information transferred from the photos to the base map, trace maps on to the four township grids, which have been prepared especially for mapping the Inaccessible Forest Zone.

(d) Have a duplicate original and blue-line copy made of each map.

(e) For each inventory block determine the total area, using the dimensions quoted in the Supplement to the Dominion Land Survey Manual for the third system of survey. Having determined the total number of plots in the inventory block, and the number in each type, the area of each type will be ascertained on a proportional basis. For example, the Oxford House Block has a total area of 1,690,278 acres and 2,588 plots, of which 327

plots are recorded as SM-1. The area of the SM-1 type is: $\frac{327}{2,588} \times 1,690,278$ or 213,571 acres.

2. Tables and Final Compilation

- (a) Prepare separate tree volume tables for black spruce and jack pine. (As the other species were of little importance, and to save time, the black spruce table was used for these.)
- (b) Prepare stand tables for each of the four merchantable types, showing number of trees per acre by species and D.B.H. class.
- (c) Prepare stand volume tables for each of the merchantable types by multiplying the number of stems per acre, in each diameter class, by the appropriate tree volume. In the final form this table will show the gross volume of each species by major size and class.
- (d) From the above, prepare net stand volume using the following cull per cent:

Spruce	10%
Balsam fir	30%
Jack pine	25%
Poplar	50%
Birch	40%
- (e) Prepare a Grand Summary Table showing merchantable volume by inventory blocks, species, and major size classes, using standard methods.

Table 11
Rotation by Species

Species	years
White spruce.....	80 - 120
Black spruce.....	80 - 140
Balsam fir.....	60 - 80
Jack pine.....	60 - 90
Tamarack.....	70 - 100
Aspen poplar.....	50 - 70
Balsam poplar.....	50 - 70
White birch.....	60 - 80

ROTATION

The length of the rotation for the various species depends on the site, the product to be cut, and, to a lesser extent, the climatic region. Table 11 gives tentative figures for the productive forest area of Manitoba. A range of rotation age is given depending mainly on whether the stand is to be cut for pulpwood or saw-timber.

ALLOWABLE CUT

A determination of the allowable annual depletion by cutting, fire, etc., is necessary in order that the forest may be kept on a sustained yield basis. The compiled inventory data presents volume by cover-type, age class, and species while area is presented by age class and cover-type only. The method of calculation most suitable to the available data is by a volumetric formula.

The simplest formula for finding the annual yield, commonly known as the Von Mantel formula, is as follows:

$$\text{Annual Yield} = \frac{\text{Growing Stock}}{\text{Half the number of years in rotation}}$$

For general inventory purposes this formula has been used as the basis for calculation of the allowable cut by Working Circles, each species being calculated separately according to its average rotation age. A deduction of 20 per cent has been made to allow for contingencies such as loss from fire, windfall, insects, and disease.

Common and Botanical Names of Tree Species Included in Timber Estimates

CONIFERS

White Spruce —	<i>Picea glauca</i> (Moench) Voss
Black Spruce —	<i>Picea mariana</i> (Mill) BSP.
Balsam fir —	<i>Abies balsamea</i> (L.) Mill
Jack pine —	<i>Pinus banksiana</i> Lamb.
Tamarack —	<i>Larix laricina</i> (Du Roi) K. Koch

HARDWOODS

Aspen poplar —	<i>Populus tremuloides</i> Michx
Balsam poplar —	<i>Populus balsamifera</i> L.
White birch —	<i>Betula papyrifera</i> Marsh.

DATE DUE SLIP

plots are recorded as

SM-1 type is: $\frac{327}{2,588}$ acres.

2. Tables and Final Compilation

(a) Prepare separate tree volume tables for spruce and jack pine. These were of little importance in the black spruce table.

(b) Prepare stand tables for merchantable types, showing volume per acre by species and size class.

(c) Prepare stand volume tables for merchantable types by size class. Number of stems per acre, in each size class, by the appropriate tree volume table. This table will show volume for each species by major size class.

(d) From the above, prepare a summary table using the following cull percentages:

Spruce

Balsam fir

Jack pine

Poplar

Birch

(e) Prepare a Grand Summary table showing merchantable volume by species, and major size class, using standard methods.

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ROTATION

Rotation for the various species is determined by the product to be cut, and, to a large extent, by the climatic region. Table 11 gives the productive forest area of each species and the rotation age is given depending on the stand is to be cut for a given product.

TABLE CUT

The allowable annual depletion, or yield, is necessary in order that a sustained yield basis. The data presents volume by species while area is present and cover-type only. The most suitable to the available formula.

For finding the annual yield, the Von Mantel formula, is as follows:

Growing Stock

number of years in rotation

For purposes this formula has been used for calculation of the allowable yield. Each species being considered according to its average rotation age. A 20 per cent has been made for losses such as loss from fire, insect, and disease.

Common and Botanical Names of Tree Species Included in Timber Estimates

CONIFERS

White Spruce — *Picea glauca* (Moench) Voss
Black Spruce — *Picea mariana* (Mill) BSP.
Balsam fir — *Abies balsamea* (L.) Mill
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Aspen poplar — *Populus tremuloides* Michx.
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White birch — *Betula papyrifera* Marsh.

Table 11
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Jack pine.....	60 - 90
Tamarack.....	70 - 100
Aspen poplar.....	50 - 70
Balsam poplar.....	50 - 70
White birch.....	60 - 80

SD 146 M3 M27 1956 NO-9
MANITOBA FORESTRY BRANCH
FOREST RESOURCES INVENTORY
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Manitoba. Forestry Branch
Forest resources inventory,
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